

# *The Life and Trials of a Pseudomeningocele.*

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## **Abstract**

This case study introduces Ms Z. It discusses her story and the nursing care of her journey with a diagnosis of a pseudomeningocele. This case study was developed using direct interviews with the patient, discussions with the patient's surgeon, research articles, viewing scans, photos and using the patient's clinical notes. The patient's journey with the pseudomeningocele spans over a 20 year period with many up's and downs throughout, resulting with what is hoped to be a better quality of life.

Ms Z's symptoms started at the age of sixteen. She experienced severe headaches when she coughed or laughed and was seen by a neurologist at the time but no clear diagnosis was made. Her symptoms continued and after multiple medical appointments, a diagnosis of Chiari Malformation was made. She had her first surgery in 2013 after which Ms Z reported her complications began to occur. She moved to New Zealand and started to get more unwell and presented to a rural emergency department (ED). She has undergone multiple procedures in New Zealand including long term intravenous (IV) antibiotics resulting from an infection previously undiagnosed. Nursing considerations will be discussed throughout the case study including peri and post-operative care for neurosurgical patients with pseudomeningoceles, complications to be aware of, and holistic support for patients - physical, emotional and psychological.

**Keywords:** *Pseudomeningocele, infection, cerebellar herniation, nursing care.*

## **Background**

This case study centres on Ms Z, a female in her 30's. Her medical history includes anxiety and obsessive compulsive disorder- with a family history of major psychotic disorders, irritable bowel syndrome and a previous miscarriage.

Symptoms of severe headaches that increased when she coughed, sneezed and laughed first appeared when she was sixteen years old but was not considered significant at the time. She saw several neurologists but all tests could not find anything significant. Finally after suffering pneumonia that had worsened her severe headaches, Ms Z without any focal neurological deficits, underwent a MRI which revealed she had a 14mm Chiari malformation.

A Chiari malformation is a condition where brain tissue extends down into the spinal canal and occurs when the skull is abnormally small (National Institute of Neurological Dis-

orders and Stroke, 2015). She was then referred to a neurosurgeon for surgery.

This decision was further complicated by Ms Z's desire to have a baby, in which case without surgery, her condition could potentially worsen when in labour.

In November 2013 she had a posterior fossa decompression and C1 laminectomy with dural repair using a tissue graft from her back and surgical glue. Post-operatively Ms Z while reflecting on her care commented that perhaps more precautions could have been taken. For example she stated no in-dwelling catheter (IDC) was inserted while on complete bedrest and due to constant morphine injections she developed constipation that was untreated for seven days. Both of these involved straining causing pressure.

Initially Ms Z progressed well, but a few weeks after she was discharged, she started experiencing postural headaches. A MRI revealed complications of a collection of occipital cerebrospinal fluid (CSF). Ms Z was advised to rest in bed for four weeks to attempt to seal the dural membrane conservatively. She was seen by both her neurologist and neurosurgeon. She underwent a second surgery in February 2014 to repair the dural tear

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using artificial tissue. Ms Z thought the surgery was successful, and felt well for several months.

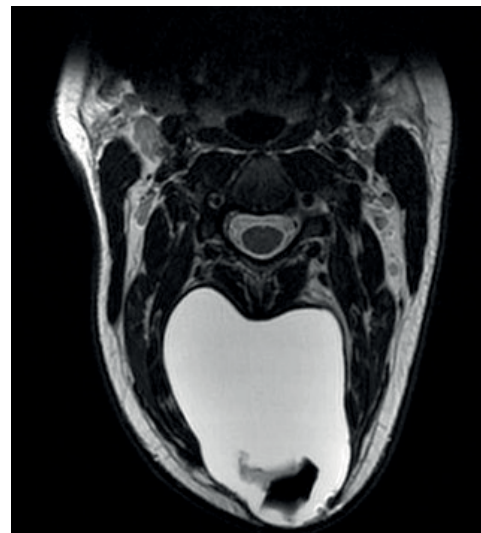
She then started to experience increasing pressure headaches and went back to her neurosurgeon in April 2014. After reviewing her MRI, the surgeon reassured her that no further surgery was required. On this MRI a floating object was seen and explained as debris, possibly remnants of the glue used. In July 2014 Ms Z noticed a bulge forming at the back of her neck. Her general practitioner referred her for a second neurosurgical opinion. This occurred in late October when she was told that she had a CSF leak into her posterior neck separating the muscles. This was a pseudomeningocele forming. It was drained by percutaneous aspiration and she was given a tight headpiece to wear to assist with decreasing the swelling. While this procedure was high risk for infection, it seemed to have an effect for a short while. There is limited information that defines a pseudomeningocele due to different etiology. However, to simplify, a pseudomeningocele is a collection of CSF encased by a fibrous capsule resulting from a dural tear either post-operatively or more rarely, a traumatic event (Hawk & Kim, 2000). In Ms Z's case it occurred post operatively.

Dural tears can be difficult to heal due to scar tissue, infection, nutritional deficits and elevated CSF pressure (Dafford & Anderson, 2015). A pseudomeningocele communicates with the CSF space of the brain and spine and differs from a meningocele as it is not lined by dura (Hawk & Kim, 2000). The risk of having a pseudomeningocele after posterior fossa surgery is approximately 15-28% but the pathophysiology of why this happens is poorly understood (Roland, Marple, Meyerhoff & Micky, 1992). Ms Z maintains she was not told that the dural tear occurred.

At this point Ms Z and her partner moved to New Zealand. She presented to a small rural hospital with severe headaches, parasthesia in both hands, mild photophobia and a non-reducible pseudomeningocele. She was transferred to Christchurch Hospital under the care of a neurosurgeon. Image 1 & 2 were taken on arrival at Christchurch Hospital showing a large pseudomeningocele with the floating "debris" seen at the base. Image 3 is Ms Z with a very obvious sub-occipital bulge in her neck.



**Image 1** (Above): MRI on arrival.



**Image 2** (Above): MRI on arrival.



**Image 3** (Above): Showing the bulge in the back of the neck.

### Treatment in Christchurch

When dealing with a pseudomeningocele the usual non-invasive measures include bedrest, involving elevating the head of bed, acetazolamide (Diamox) and steroids (Couture & Branch, 2003). More invasive treatments include percutaneous aspiration which involves the evacuation of fluid from a space below the skin with a needle, catheter or syringe in a cavity or space. Other treatments involve surgical exploration to determine other factors that can be causing the pseudomeningocele and lumbar drainage involving insertion of an extraventricular drain (EVD) and lumboperitoneal (LP) or ventriculoperitoneal (VP) shunts to drain and divert the flow of CSF (Couture & Branch, 2003).

On admission, Ms Z had a lumbar drain (LD) inserted with an opening pressure of 35mmHg which is considered quite elevated, normally it should be between 0-15mmHg (Barker, 2008). A CSF sample revealed protein levels of 1.86 g/L; normal is considered 15-45mg (Cerebrospinal Fluid, 2013). The white cell and red cell count were unremarkable. The gram stain was negative.

Soon after the insertion of the LD the pseudomeningocele reduced and symptoms were resolving. An LP shunt was then inserted to divert the flow of CSF to allow healing. Unfortunately a CSF culture from the initial LD insertion then grew *Propionibacterium acnes* (*P. acnes*). This is a gram-positive human skin organism that prefers anaerobic growth conditions (Bhatia, Maisonneuve & Persing, 2004). *P. acnes* is suspected to be discreetly involved in post-operative infections. It is of low virulence but found almost everywhere on the skin (Bhatia, Maisonneuve & Persing, 2004). A referral was made to the Infectious Diseases team who recommended treatment of benzylpenicillin and rifampicin which are both sensitive to serious staphylococcal infections (Bamberger & Boyd, 2005).

After two weeks, Ms Z's headaches and pseudomeningocele had returned. Tests showed the infection was still persistent but subclinical. The team decided to remove the LP shunt, continue with the antibiotic therapy and insert another LD. Along with removing the LP shunt the team removed the "debris" seen in the MRI and performed a dural repair with fascia lata graft which involved a graft from Ms Z's thigh muscle. The neurosurgical team worked with a plastic surgeon to perform the left upper trapezius flap reconstruction in which the trapezius muscles were used for

the reconstruction of Ms Z's neck (Yoon, S, Song, Kang, Yoon, Y, Koo, & Oh, 2012). The "debris" was sent for histology and was found to be the source of infection.

Postoperatively CSF samples showed improvement. Ms. Z's surgical wound was healing well and there was no evidence of the pseudomeningocele. The LD was left open for a week, draining 10-15ml/hr. Ms Z was kept in the neurosciences progressive care unit (a four bed unit within the ward allowing 1:2 nursing) post-op for close monitoring during this time.

### Further Complications

On day 7, a routine MRI (see image four) revealed asymptomatic cerebellar herniation with the formation of a syrinx. Cerebellar herniation (also known as coning) occurs when the cerebellar tonsils move downward through the foramen magnum causing compression of the brainstem and spinal cord (Barker, 2008). Increased pressure on the brainstem can result in dysfunction of the centres in the brain responsible for controlling respiratory and cardiac function (Barker, 2008). In Ms Z's case, the cerebellar herniation occurred due to the pressure of the LD, which promoted cerebellar sagging causing an abnormal CSF communication and resulted in the syrinx (Rubin, 2014). A syrinx forms due to partial obstruction of CSF flow and the CSF collects into a tubular cyst on the spinal cord. The syrinx resolved on its own when upward shifting of the cerebellar tonsils occurred (Rubin, 2014). The LD was then removed and replaced with a VP shunt. After the VP shunt insertion, Ms Z improved and was discharged home on IV antibiotics given by community health nurses.

### Nursing care

Nursing care plays a major role in every patient's recovery. With Ms. Z, it was important that the nurses had the knowledge and skills to look after a patient with a lumbar drain, knew the disease process and what to observe (Palmer & Chiu, 2012). It is emphasised that nurses are skilled in recognising early intracranial pressure (ICP) changes. In Ms. Z's case this was challenging in that she was asymptomatic. It is important to keep patients on bedrest unless specified by the surgeon, and to limit activities that would contribute to increased ICP such as straining, coughing and pain (Hickey, 2009).

Nurses can assist in keeping ICP down by giving the patient adequate pain relief and stool softeners to avoid straining and provid-





**Image 4** (Above): showing herniation and syrinx

ing a low stimulus environment. Nurses must remember to clamp the drain for any procedure or activity that would increase patient's ICP such as washing, pressure area cares, voiding, and vomiting (Lumbar CSF drain, 2015). Signs of increasing ICP include decreased level of consciousness, headache and pupillary abnormalities (Hickey, 2009). It is vital that nurses perform neurological observations a minimum of four hourly or more frequently depending on the need and vital signs are monitored. Any changes in the level of consciousness or a drop of two points from the previous Glasgow Coma Scale (GCS) score should be reported to the surgical team immediately. Throughout Ms Z's stay she maintained a GCS of 15/15.

As part of the nursing assessment, CSF should be monitored for any changes in the colour or appearance (Hickey, 2009). Typically normal CSF is clear, colour and consistency changes can indicate the presence of red blood cells, increased protein and increased white blood cells (Hickey, 2009). The drain height, patency, amount of CSF should be checked hourly and documented on the appropriate CSF monitoring form (Lumbar CSF drain, 2015). Observing the LD insertion site for any leakage is important as leakage indicates the drainage system is no longer sterile (Lumbar CSF drain, 2015).

Ms. Z had great support from her father and partner during her time on the ward. Involving the patient's family helps ensure the patient's specific cultural needs are met, especially if this patient is unable to communicate. It is important to explain to the patient and the family the reasons for maintaining certain bed

position or height so they can understand why this is necessary (Lumbar CSF drain, 2015). Involving the family in activities of daily living such as assisting with feeding or washing can help both the patient to feel more at ease and the family to feel more involved.

Low stimuli environments are vital for patient recovery, as stimuli can contribute to increase ICP (Lumbar CSF drain, 2015). Explain the reasoning for this to both the family and patient and emphasise that visiting hours are restricted in order to let the patient rest. Developing good therapeutic relationships with the patient is important, as being in hospital can be difficult and having the support of someone when family isn't around can be beneficial. Unfortunately during her last admission, Ms Z ended her relationship with her partner and this required extra emotional support and understanding from the nursing team.

#### After treatment

Ms Z was discharged from the ward to the community nurse for ongoing IV antibiotic treatment for a further three weeks. Outpatient follow up occurred three months later where she was found to be well and had no signs of a pseudomeningocele, or infection.

#### Implications for practice

There is little to be found in the literature surrounding the topic of nursing care of patients with pseudomeningoceles, leaving scope for nurse-led research in this area. The aim of this case study was to raise awareness of this neurosurgical diagnosis. This would help nurses to understand the anatomy and physiology of this condition and its associated complications in order to best address patient care.

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